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Dr. Shabir Ahmad Mir
Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India

Waseem Dar
Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India

Sasjad Tak
Department of Medicine, Government Medical College Srinagar, Jammu and Kashmir, India

Mumtazdin Wani
Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India

Correspondence
Dr. Shabir Ahmad Mir
Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India

A tertiary care experience of conservative management of blunt renal trauma in northern India: A prospective study

Dr. Shabir Ahmad Mir, Waseem Dar, Sasjad Tak and Mumtazdin Wani

Abstract
Background: Blunt renal injury usually involves high energy mechanism such as road traffic accidents. Over the last few decades there has been a major shift towards the nonoperative management of blunt renal trauma.
Aims and Objective: To analyze the conservative management of blunt renal trauma at our tertiary care centre.
Material and Methods: This prospective study was conducted over a period of 5.5 years in unit-II of the department of surgery, SMHS (Shri Maharaja Harisingh) hospital, an associated hospital of Govt. Medical college Srinagar, from June 2012 to November 2017. A total of 23 patients were enrolled in this study. All blunt renal injuries were graded according to American Association for the Surgery of Trauma (AAST) organ injury severity scale. The study included 23 patients with CT documented ≤ grade III renal trauma in 17 patients and > grade III in 6 patients.
Results: A total of twenty three patients with mean age of 31 years (ranging from 11 to 49 years) have been included. Road traffic accident was the predominant mechanism (15 patients). One Grade 4 and three grade 5 blunt renal injury patients who were hemodynamically unstable despite of aggressive resuscitation and had concomitant liver and/or splenic injuries needed exploration for hemodynamic instability and underwent nephrectomy, otherwise all cases were managed nonoperatively. Two patients underwent splenectomy for Grade 5 splenic injury.
Conclusion: Conservative management for blunt renal injuries is safe and viable management option in majority of the patients.

Keywords: blunt trauma, renal, traffic accidents, nonoperative management, computed tomography

Introduction
Kidneys are important organs in our body and every effort needs to be made to preserve them whenever safely possible. Over last few decades, nonoperative management (NOM) of solid organs injuries is getting well established. The kidneys are located in the retroperitoneal space, enclosed by Gerota's fascia. Because of this protected position, it is one of the less injured solid organs in trauma. Renal injuries occur in approximately 1 to 3% of all trauma patients and in 10% of abdominal trauma [1-3]. The kidney is the most commonly injured genitourinary organ in blunt trauma followed by the bladder in both adult and pediatric populations. Incidence is higher in male with male to female ratio of 3:1. It is more frequent in between the second and third decades [4]. Nowadays, NOM is the standard of care for stable patients with blunt renal trauma [1, 3]. Advances in radiographic injury grading, improvements in hemodynamic monitoring, validated renal injury grading systems, and essential information about the mechanisms of injury allow successful non-operative management strategies for renal preservation even in cases of high grade (Grade IV and V) or severe renal injuries [5]. In this study, we made an attempt to analyze the conservative management of blunt renal trauma at our tertiary care centre.

Methods
This prospective study was conducted over a period of 5.5 years in unit-II of the department of surgery, SMHS (Shri Maharaja Harisingh) hospital, an associated hospital of Govt. medical college Srinagar, from June 2012 to November 2017. Patients with diagnosis of renal injury due to blunt trauma were included in the study, where as those with penetrating were excluded. A total of 23 patients were enrolled in this study. Blunt renal injuries were graded according to American Association for the Surgery of Trauma (AAST) organ injury severity scale.

The study included 23 patients with CT documented ≤ grade III renal trauma in 17 patients and > grade III in 6 patients. The following data were collected: demographics, mechanism of injury, associated injuries, admission hemoglobin, blood transfusion, CT findings, renal injury grade, presence of other organ injuries on CT scan, type of management, indication for operative intervention, operative procedures, operative findings, any other interventions required, hospital stay, morbidity, and mortality. Advanced Trauma Life Support (ATLS) protocol was routinely applied.

NOM (Nonoperative management) protocol:

1. Hemoglobin or hematocrit measurement every 6 h in the first 24 h or more frequently in the case of clinical deterioration.
2. Arterial blood gas measurements every 12 h in the first 24 h or more frequently in the case of clinical deterioration.
3. ICU admission.

NOM failure was defined by the need for surgical intervention due to continuous hemodynamic instability, progressive fall of hemoglobin or hematocrit levels, with recurrent blood transfusion or clinical signs of peritonitis.

Above protocol was followed in our study to a great extent except for the routine ICU admission. Vigorous monitoring was done in general surgical ward setup during first 2-3 days of trauma consisting of hourly monitoring by the resident doctor on the 1st day and 3-hourly monitoring thereafter. Monitoring parameters included pulse, respiratory rate, blood pressure, temperature, input, and output. Patients were discharged on day 4th to 13th. Follow-up was scheduled at 2 weeks, 1 month, 3 months, and so on.

Statistical analysis

The recorded data was compiled and entered in a spread sheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages.

Results

Twenty three patients with renal injuries were included. The mean age of the patients was 31 years ranging from 11 to 49 years. Majority of the patients were males (20 males and 3 females). Road traffic accident was the predominant mechanism (15 patients). Other causes involved fall from a height (5 patients), violence (two), and hit by animal (one). Other significant visceral injuries associated with renal injury were liver injury in 4 cases, and splenic injury in 6, and pulmonary contusions in one. Figure 1 shows the contrast extravasation on the CT scan of a blunt renal trauma patient.

Fig 1: CT scan shows contrast extravasation in a patient with blunt renal injury.

The AAST grading of all the blunt renal trauma are (Moore *et al.*, 1989) [6]:

Grade Type Description

1. Contusion: Microscopic or gross hematuria, urologic studies normal

Hematoma: Subcapsular, nonexpanding without parenchymal laceration

2. Hematoma: Nonexpanding perirenal hematoma confined to renal retro peritoneum

Laceration: <1 cm parenchymal depth of renal cortex without urinary extravasation

3. Laceration: >1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation

4. Laceration: Parenchymal laceration extending through renal cortex, medulla, and collecting system

Vascular: Main renal artery or vein injury with contained hemorrhage

5. Laceration: Completely shattered kidney

Vascular: Avulsion of renal hilum, devascularizing the kidney

Various demographic and clinical results are depicted in tables 1-4.

Table 1: Age distribution

Age group	Number
11-20	5
21-30	7
31-40	6
41-50	5

Table 2: AAST Grade of Renal Injury

Laterality of renal trauma	Isolated	Associated with other visceral injuries	Total	Grade ≤ III renal trauma	Grade> III renal trauma
Right renal	5	4	9	7	2
Left renal	7	7	14	10	4

Table 3: Clinical Variables

AAST Grade of Renal injury	Mean Hb at presentation (gm/ dl)	Mean Total blood transfusion received (units)	Management	Mean Total hospital stay (days)
1	10.2	0	Conservative (4)	5
2	9.3	0	Conservative (8)	5
3	8.4	2	Conservative (5)	7
4	7.1	4	Conservative (2) Nephrectomy (1)	9
5	5.7	6	Nephrectomy (3)	11

One Grade 4 and three grade 5 blunt renal injury patients who were hemodynamically unstable despite of aggressive resuscitation and had concomitant liver and/or splenic injuries needed exploration for hemodynamic instability and underwent nephrectomy, otherwise all cases were managed nonoperatively. Two patients underwent splenectomy for Grade 5 splenic injury. Grade 1 and 2 renal injuries did not require any blood transfusion.

There was no mortality due to blunt renal trauma during admission in the hospital.

Discussion

We conducted the present study in a prospective style and observed that majority of the blunt renal injuries can be managed by a conservative strategy. In our study twenty three patients with renal injuries were included. The mean age of the patients was 31 years ranging from 11 to 49 years. Majority of the patients were males (20 males and 3 females). According to Bent C *et al.*, blunt trauma due to motor vehicle is the most common mechanism of renal injury [4]. Road traffic accident was the predominant mechanism (15 patients) of blunt renal trauma in our study also. One Grade 4 injury and three grade 5 who were hemodynamically unstable despite of aggressive resuscitation and had concomitant liver and/or splenic injuries needed exploration for hemodynamic instability and underwent nephrectomy, otherwise all cases were managed nonoperatively. Two patients underwent splenectomy for associated grade 5 splenic injury. Grade 1 and 2 renal injuries did not require any blood transfusion. In our study there was no mortality due to blunt renal trauma during admission in the hospital. Bretan *et al.* followed up with a study demonstrating that CT was the imaging modality of choice for evaluating renal trauma [3]. We routinely subjected our patients who we suspected to have renal injuries to CT scan because it can diagnose other solid organ abdominal injuries in addition to kidney injuries and can be obtained rapidly in our emergency room. Mingoli *et al.* in their meta-analysis of over 13,000 renal trauma cases found that non-operative management was the most prevalent strategy used in 82.4% of renal trauma patients versus 17.3% who underwent operative management [8]. Nonoperative management has become the preferred way of managing BRIs (blunty renal injuries), even for high-grade injuries [9, 10]. Shariat *et al.* [11] successfully managed nonoperatively 41 of 51 patients with a grade IV BRI (80%). Indication of exploration was hypotension and acute abdomen. Hemodynamic stability was the indication for conservative management. The goals of nonoperative management of blunt renal injury are to identify, manage, and limit associated complications – including urinary extravasation, urinoma, infection, bleeding, and, most importantly, loss of renal function or unnecessary nephrectomy. Such complications have been reported in 3% to 33% of patients after renal trauma [12]. Clinical management of such complications is directed primarily by objective clinical signs and symptoms (i.e., hemodynamic instability, increasing pain, fever and leukocytosis, decreasing hematocrit and blood transfusion requirement) and not by imaging results [13]. Even in cases where imaging results demonstrate known harbingers of urologic complications (devascularized segments, urinary extravasation), continued nonoperative management has proven practicable, with intervention based on clinical rather than radiographic criteria [13]. Although management of renal contusion and minor laceration is usually straightforward, there is no consensus on optimal management of high-grade injury.

Conclusion

Conservative management for blunt renal injuries is safe and viable management option in majority of the blunt renal trauma patients. Contrast enhanced CT further helps in knowing the level of alertness needed during nonoperative management by providing the grading/severity of renal injury. However one should remember that nonoperative management should never be at the cost of patient's life in haemodynamically unstable patients.

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